between the two boundaries, and the whole coast-line being about a thousand kilometres in length. The whole of this wide expanse is threatened by ruin, ruin compared to which the ravages of the phylloxera are mild. The last news which we had from the western province was that around Tlemçen, on the frontier, flights of locusts were alightihg unintermittently, and that a caravan just arrived there from Morocco had travelled for thirty-two days in the midst of locusts, the country being entirely devastated. I have said enough to show how the central department of Algiers is threatened, and now on the borders of Tunisia, advancing from the east, we had met once more with the dread hordes. The night before our arrival at Bône, the frontier port, a train coming thither from Tunis had been actually blocked for half an hour by a swarm at a little place called Oued-Zerga, and in the capital of the Beys the natives were trying to make the best of the plague by cooking and selling the *sauterelles* for food.

I have not the space, even if I had the technical knowledge, to describe the means by which Algerian cultivators are trying to stay the pest; how they set about the unpleasant work of destroying the eggs, and how, after incubation, they devise methods for stopping the march of the *criquets*, which, if unchecked, literally eat their way along, leaving the most verdant and fertile tracts a brown wilderness. Suffice it to say, that not only are the local authorities, the maires, and sous-préfets, organizing resistance and raising subsidies for the struggle, but, what is more significant in a territory which is above all things a military training-ground for France, the general commanding the forces in Algeria has granted a remission of thirteen days to all cultivators called to serve with the colors, whose properties are menaced by the locusts.

My last glimpse of the country, which I have the greatest reason for loving that a woman can have, was across the vineyards whose leafy lines stretch in never-ending vistas over the rich plains by the Tunisian frontier, and I thought of the sinister Arab prophecies which foretold that, after the conquest by the Franks of this fair land, an army of invaders, worse even than they, should come up from the desert, and extend the boundaries of the Sahara to the shores of the Mediterranean.

VARIETY AND PLANTING OF CORN.

BULLETIN No. 15 of the Pennsylvania Agricultural Experiment Station is a report of experiments on the influence of variety and the rate of seeding on the yield of ensilage corn. Two varieties of corn were planted, one the field corn ordinarily grown in that locality, the other Breck's Boston market ensilage, a large-growing variety which barely reaches the glazing stage before frost in that locality. Both varieties were sown in duplicate plots, of two rates of seeding each, the plots being alternated. The rows were three and a half feet apart, with guard rows between the plots, so that the ground was all equally occupied. Manure was applied liberally, but by a mistake the thick-seeded plots received larger quantities of manure as well as of seed. The thin-seeded plots were planted so that the stalks stood fourteen inches apart in the rows, while on the thick-seeded plots the stalks were three and a half inches apart.

The average yield of each pair of plots, calculated to one acre, was: small, thin-seeded, 11,962 pounds; small, thick-seeded, 19,013 pounds; large, thin-seeded, 20,955 pounds; large, thick-seeded, 26,840 pounds. It appears, therefore, that the larger variety gave a decidedly larger yield than the smaller one, and that thick seeding was decidedly more profitable than thin seeding.

Chemical analyses were made of samples from the various plots, from which it appeared that the produce of the larger variety and of the thicker seeding showed even greater superiority than that indicated by the gross yield.

Experiments similar to the foregoing have been conducted at the Ohio Experiment Station over several seasons, and these have uniformly showed a larger yield, both of grain and fodder, and therefore of food for animals, when the corn was so planted that the stalks stood about six inches apart in rows about three and a half feet apart, than when the distance between the stalks was greater. As between planting six inches apart and three inches apart, the Ohio experiments show better results from the six-inch planting.

Such close planting as this causes the ears to be chiefly nubbins, and therefore it is not to be recommended when merchantable grain is the product desired; but for silage purposes it is not necessary that the grain should be merchantable.

THE TRANSANDINE RAILWAY.

THE Transandine Railway now in process of construction across the Andes Mountains, for the purpose of connecting the railway systems of Chili and the Argentine Republic, is an enterprise involving many engineering difficulties. London *Engineering* has devoted considerable space to a series of illustrated articles on the railway and its construction, from which we gather the following facts.

The length of the new railway is 149 miles, of which 109 miles are on Argentine territory, starting from the city of Mendoza, which is 2,376 feet above the sea. In Chili there are forty miles, connecting with the Chilian system at Santa Rosa, 2,704 feet above sea-level. The greatest height attained by the railway is 10,460 feet above sea-level, the tunnel at that point being some two thousand feet below the summit of the mountains. There are eight tunnels grouped near the summit, aggregating 9.32 miles in length, the longest, the summit tunnel, having a length of 5,540 yards. To overcome a part of the difference in level within a short distance, and at suitable working gradients, it has been found necessary to construct a spiral tunnel 2,061 yards long, with a radius of 200 metres and a grade of eight feet in a hundred. It may be added that this grade is maintained through the whole nine miles of tunnelling, except, of course, in the summit tunnel.

It is in the boring of these tunnels that the greatest engineering difficulties are encountered. The absence of fuel, and the enormous expense of obtaining it, put steam out of the question as a motive power for driving the air compressors,—air-actuated drills being the means employed for boring the tunnels. Water power, the only other means available, was to be had, but at a considerable distance from the work. It was therefore decided to use the water-power for driving electro-dynamos, transmit the electric current by copper conductors to the sites selected for the compressors, convert it into power by means of electro-motors, thereby actuating the compressors and furnishing compressed air for the drills. The installations for this purpose are unique, as it is probably the first time that the power for compressing air for drills has been conveyed such a distance by electric cables. There are three installations, one upon the Argentine and two on the Chilian side of the Andes, each being distinct in all points, except that the primary stations on the Chilian side are both located at one place. Each installation has a primary station, where the turbines and dynamos are situated, and a secondary station, with electro-motors and air compressors.

The Chilian installation consists of two primary stations under one roof at Juncal, with secondary stations at Juncalillo and Calavera, and separate cables for transmitting the current. The power for driving the turbines is obtained from the Quebrada Juncalillo, the water being conveyed to the turbines, a distance of 1,420 yards, by a double line of steel pipes. The primary station at Juncal for the Juncalillo station consists of six Girard turbines, each giving 80 horse-power, a total of 480 horse-power. Each 80 horse-power turbine is coupled directly to the shaft of an 80 horse-power dynamo, consequently there will be no loss of power in transmission from the turbines to the dynamos. The latter are grouped in two groups of three dynamos each, each group having a main and return transmission cable. A great advantage is gained in having two groups, as should accidents or other cause prevent one from being worked, the whole of the tunnelling would not be stopped. At the secondary station at Juncalillo, about 3,281 yards from Juncal, the power available is 401.8 horse-power, cables being attached to six electric motors, similar to the 80 horse-power dynamos, which drive six air compressors.

The Juncal-Calavera installation is very similar to the one described above. The turbines are in the same shed, and take their water from the same source. These and the dynamos are also of

the same size and power, but since the distance from Juncal is 7,000 metres, against 3,000 metres for Juncal-Juncalillo, the power available at Calavera for driving the compressors is proportionately less, and only four compressors are driven.

In the Argentine installation the water-power is derived from the Quebrada Navarro, the water being conveyed to the turbines, a distance of 383 yards, by a single line of steel pipes. Owing to the difficulties of travel upon the Argentine side of the mountains, 80 horse-power dynamos were found to be too heavy for transport, and machines of half the power were therefore adopted. At the primary station at Navarro four Girard turbines of 80 horse-power each are used. Each turbine drives two 40 horse-power dynamos directly from its horizontal shaft, one on either side. The machines are in two groups, each of two turbines with four dynamos. One group can be worked independently of the other, should any accident arise, provided it does not affect the source of water supply. The 30 horse-power motors at Las Cuevas are similar to the dynamos at Navarro, and there is about 224 horse-power available for driving the compressors, which are of the same type as those for the Chilian installations. In the three installations, the air is conveyed from the compressors into large steel reservoirs, and from thence to the drills in wrought-iron pipes. The drills are mounted upon carriages, in groups of six, and are run forward on rails to the work.

The several stations are connected by telephone, so that, although the works are widely separated, the same initial power which is, by the various processes, converted into active work at the rock face, affords the means of instant and easy communication with all parts of the works. The workshops are lighted by electricity generated by a separate 10 horse-power dynamo.

THE EXPEDITIONS TO GREENLAND.

ON June 6 the whaling steamer Kite, which has been chartered for the purpose, left this port for Greenland, having on board two parties of explorers bent on adding to our knowledge of Greenland.

One of these parties is under the command of Lieutenant Peary, U.S.N., and is known as the North Greenland Expedition. Of their plans we give an account below. The other is known as the West Greenland Expedition, and consists of Professor A. Heilprin, the geologist, who will command; Professor Holt and Professor Benjamin Sharp, zoölogists; Professor W. E. Hughes, ornithologist; Dr. W. Burk, botanist; Dr. R. N. Keeley and Frazer Ashurst, surgeons; Professor L. W. Mengee, entomologist, and A. C. Kenealy. The West Greenland expedition will, after reaching Whale Sound on the Kite, proceed southward either to Upernavik or Disco Bay and finally to Godhaven, from which point the party will journey in the Kite to Ivigut and thence to St. Johns, Newfoundland. This section of the expedition expects to return about the middle of September.

The plans of the North Greenland Expedition are set forth in a letter from Lieut. Peary to the New York *Sun*, of which we give the following abstract: —

"My party will be landed in June or early in July at Whale Sound, latitude 77° 30′ north. The remainder of this season will be devoted to hunting for the winter's supply of meat, examining the features of the Whale Sound region, collecting natural objects, and more especially to reconnoissances of the inland ice in various directions. It is anticipated that one of these reconnoissances will be carried across the great tongue of the inland ice covering Prudhoe Land to the southern angle of Humboldt Glacier, and an advance depot for the main sledge journey established there. The winter will be occupied in making and fitting sledges, clothing, and all travelling equipment, and in snowshoe and skier practice, for which the level surface of Inglefield Gulf (head of Whale Sound) is especially adapted.

"Early next spring four of five of the party will start over the inland ice to Humboldt Glacier, with full sledges and dogs if practicable. Should favorable advance be made, this party will continue on from Humboldt Glacier to the head of Petermann Fjord. Here a second depot of supplies will be deposited, and from this point the advance party of two or three will push on with full sledges, the others returning to Whale Sound, to devote their tim during the absence of the main party to meteorological observa tions, collecting, and surveying. The main party will proceed from the head of Petermann Fjord to the head of the Sherard Os borne Fjord, establish a depot there, thence to the head of D Long Fjord, establish a depot there, thence to the northern ter minus. This point reached and determined, the main party will retrace its steps to Whale Sound, taking up the various depots, and the entire party will then seize the first opportunity to come out.

"The salient features of the project are the smallness of the party and the utilization of the great interior ice plateau, the imperial highway of inner Greenland, as a road, instead of the sea of ice; and the whole theory of the project rests upon the now well-established fact that the interior of south and middle Greenland is covered with an uninterrupted ice cap, and the more than probability (in my opinion) that in north Greenland the conditions are the same, and the ice cap nearly, if not quite, coextensive with the land."

"My personal impression is that the northern terminus of Greenland is not north of the 85th parallel of latitude, and that the inner ice cap is practically co-extensive with the land; and this opinion is shared by Judge Daly and, I think, by most other eminent geographers. But whether this is the case, or whether Greenland extends as an Arctic continent across the pole, or is connected more or less loosely by detached masses of land with Franz Josef Land, or whether the ice cap ends at about the 82d parallel, as in Grinnell Land, I feel confident that in any contingency the efforts of my party will result in discoveries of interest, and, I hope, of considerable value to the scientific world. Should the Greenland ice cap terminate at or south of the 82d parallel, as Gen. Greely believes, I shall endeavor to follow its edge to the unknown east coast above Cape Bismarck.

"The especial advantages of my overland route over all others I regard to be as follows: the possibility of laying a straight course from point to point, with the certainty that no tidal crack or chaos of heaped-up ice will compel a long detour, or stop all further advance; that every foot travelled is a foot advanced, and the comforting assurance that nothing can happen to cut off the retreat; the even and unvarying character of the surface to be traversed, and the gain in lightness of sledges and equipment, and rapidity of advance resulting therefrom; the length of season (at least six months) during which sledging may be prosecuted; the facilities that the 'nunataks,' or island mountain-tops, which project above the 'inland ice' at distances varying from two or three to forty miles from the edge of the ice, offer for forming depots of provisions; and the exceptional value of the elevation of the route in accurately charting the coast and detecting the existence of more northerly land or lands."

"My base is the one advocated by Kane, Hayes, Hall, Judge Daly, and almost every American Arctic authority,— a region having a small and kindly native population, abounding in game, and within easy reach of the whalers which pass Cape York every year on their way to the fishing grounds in Lancaster Sound and adjacent waters. My proposed line of advance is absolutely direct throughout each stage. If it were not desirable to touch at the heads of Petermann, Sherard Osborne, and the other principal fjords which interrupt the northern coast, and determine their length and the characteristics of their heads, the line of march might follow very closely a great-circle course from the head of Whale Sound to beyond Lockwook's 'farthest.'

"As to the dangers and hardships of an eighteen months' sojourn above the 77th parallel, sentiment and imagination aside, I believe them to be no greater than they would be in northern Norway, Siberia, the higher Alps, or, to come nearer home, in Montana or Dakota in winter. It may be news to many to know that there are now in Greenland, under climatic conditions and environments similar to those of my proposed headquarters, Danish officers with their wives and families, living the same home life as the better classes here, with their window gardens, their music, their books, and all the other accessories of culture. I shall endeavor to collect all the scientific material and make all the observations practicable, but my first and last object will be the at-